NCV885300EVB

NCV885300 Evaluation Board User's Manual

ON Semiconductor®

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EVAL BOARD USER'S MANUAL

Description

The NCV885300 evaluation board provides a convenient way to evaluate and integrate a complete high-efficiency non-synchronous buck converter design. No additional components are required, other than dc supplies for the input voltage and enable pin. The board can also be connected to an external clock source to synchronize the switching frequency. The power good signal can be pulled up externally with the PG+ pin. The board is configured for a 5.0 V output with a 340 kHz switching frequency and a 3 A current limit, intended for applications requiring 2 A of current.

Modifying the NCV885300 evaluation board for different output voltage, switching frequency, or current limit is straightforward, requiring minimal component changes.

Key Features

- 5.0 V Output Voltage
- 340 kHz Switching Frequency
- 2.0 A Current Limit
- Power Good Signal
- Wide Input Voltage of 6.0 V to 36 V
- Regulated through Load Dump Conditions
- External Clock Synchronization up to 500 kHz
- Automotive Grade

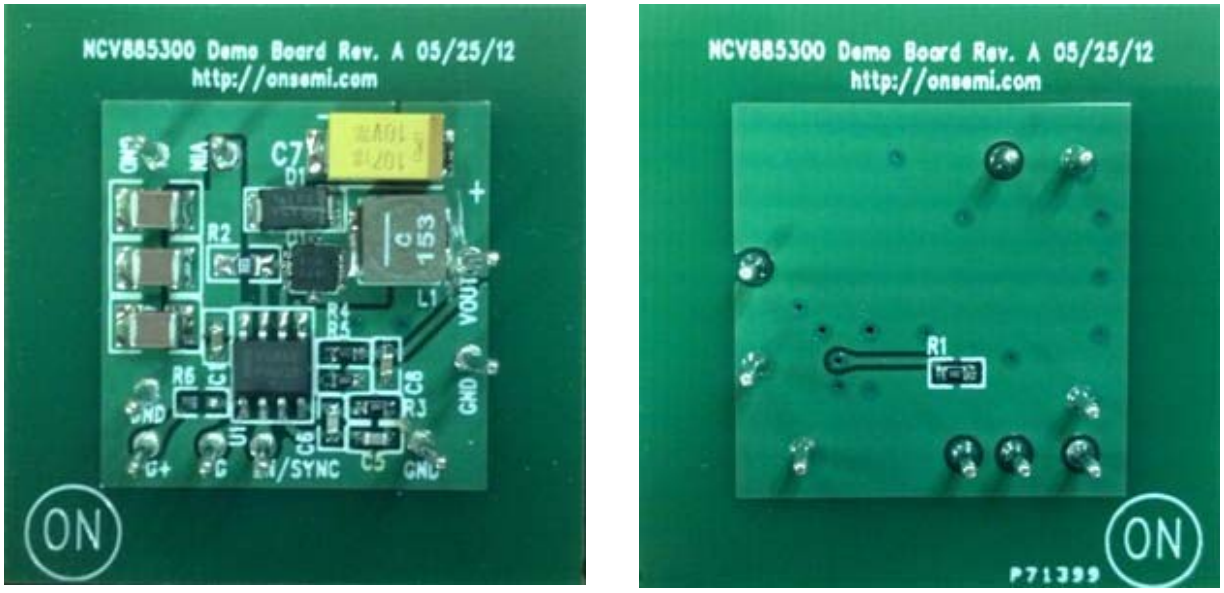

Figure 1. NCV885300EVB Board Picture

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Table 1. EVALUATION BOARD TERMINALS

Pin Name	Function
VIN	Positive dc input voltage
VOUT	Regulated dc output voltage
GND	Common dc return
EN/SYNC	Enable input and external clock synchronization input
PG	Digital power good output
PG+	Power good pull-up. Use this pin only when pulling-up PG to an external voltage source.

Table 2. ABSOLUTE MAXIMUM RATINGS

(Voltages are with respect to GND)

Rating	Value	Units
Dc supply voltage (VIN)	-0.3 to 36	V
Dc supply voltage (EN/SYNC, PG, PG+)	-0.3 to 6.0	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Table 3. ELECTRICAL CHARACTERISTICS

(T_A = 25°C, 6.0 V ≤ V_{IN} ≤ 36 V, $V_{EN/SYNC}$ = 5.0 V, 0 ≤ I_{OUT} ≤ 2.0 A, unless otherwise specified)

Characteristics	Conditions	Typical Value	Units
Regulation			
Output Voltage		5.0	V
Voltage Accuracy		2	%
Line Regulation	I_{OUT} = 1.0 A	0.04	%
Load Regulation	V_{IN} = 13.2 V	0.12	%
Switching			
Switching Frequency		340	kHz
Soft-start Time		2.0	ms
SYNC Frequency Range		270 to 500	kHz
Current Limit			
Cycle-by-Cycle Current Limit		3.33	A
Over Current Protection Threshold		5.0	A
Protections			
Input Undervoltage Lockout (UVLO)	V_{IN} decreasing	3.1	V
Thermal Shutdown	T_J rising	170	°C

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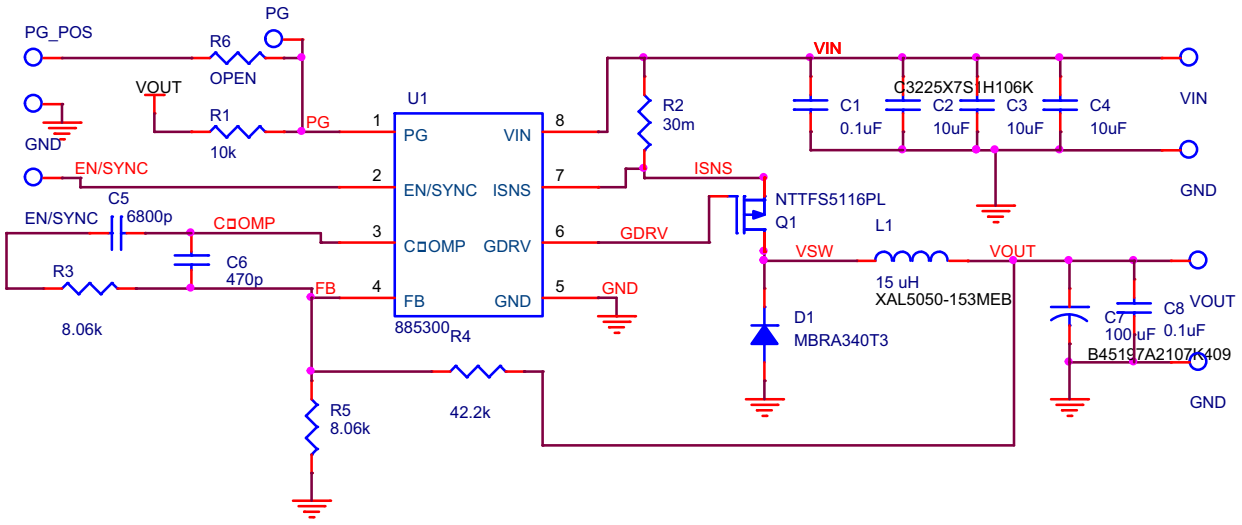

Figure 2. NCV885300EVB Board Schematic

Operational Guidelines

1. Connect a dc input voltage, within the 6.0 V to 36 V range, between VIN and GND
2. Connect a load between VOUT and GND
3. Connect a dc enable voltage, within the 2.0 V to 5.5 V range, between EN/SYNC and GND
4. Optionally, for external clock synchronization, connect a pulse source between EN/SYNC and GND. The high state level should be within the 2.0 V to 5.5 V range, and the low state level within the 0.0 V to 0.8 V range, with a frequency within the 270 kHz to 500 kHz range.

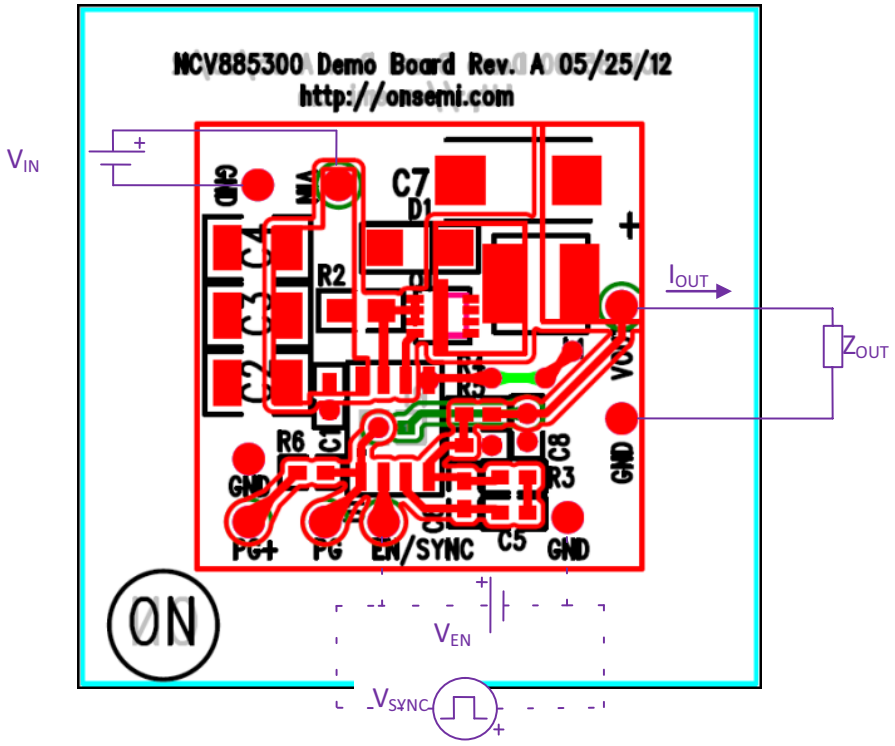

Figure 3. NCV885300EVB Board Connections

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Power Good Operation

- The Power Good pin (PG) allows you to digitally monitor the output voltage. When VOUT is above 90% of the expected value, the PG signal is in a high state. By default, PG is pulled high to VOUT through a 10 kΩ resistor.
- Optional: To pull the PG pin high using a signal other than VOUT, please make the following board modifications:

1. Remove R1 from the board.
2. Populate R6 with a 10 kΩ resistor.
3. Connect the a voltage source between PG+ and GND (please see the Absolute Maximum Ratings table for more information).
4. PG is now ready to digitally monitor VOUT using an external pull-up.

TYPICAL PERFORMANCE

Regulation

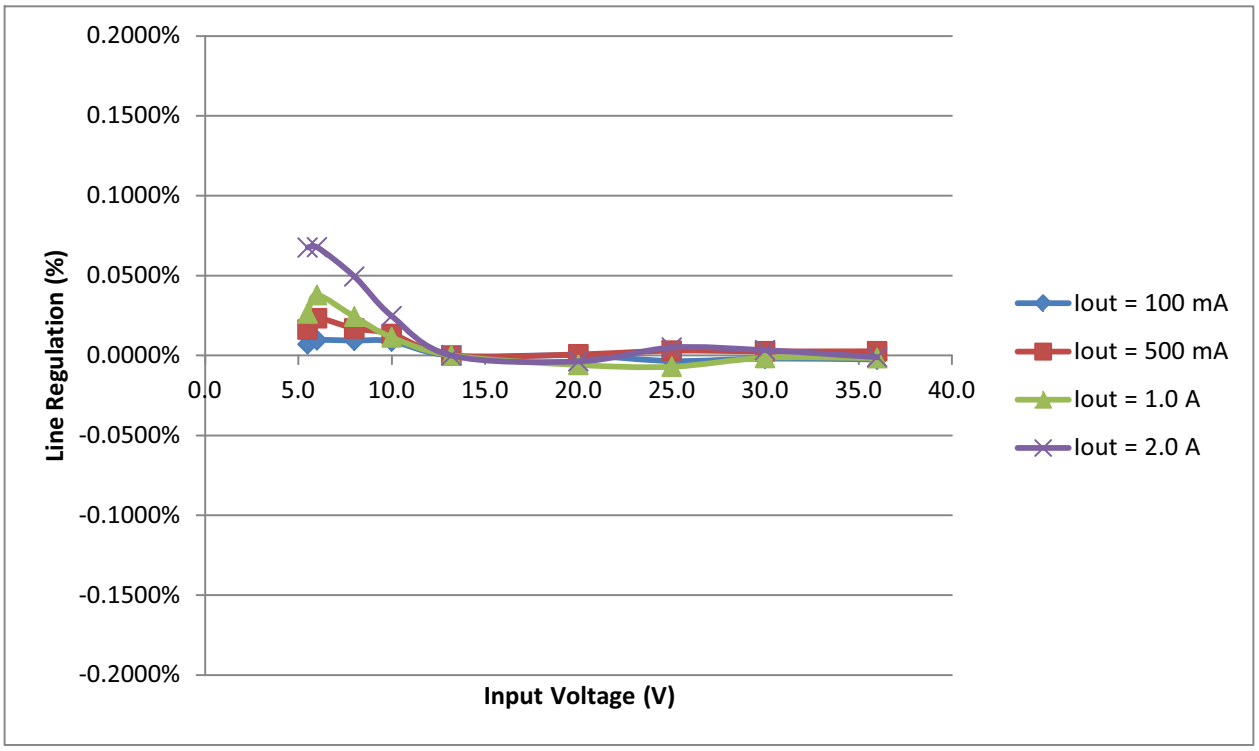

Figure 4. Line Regulation for 340 kHz and a 5.0 V Output

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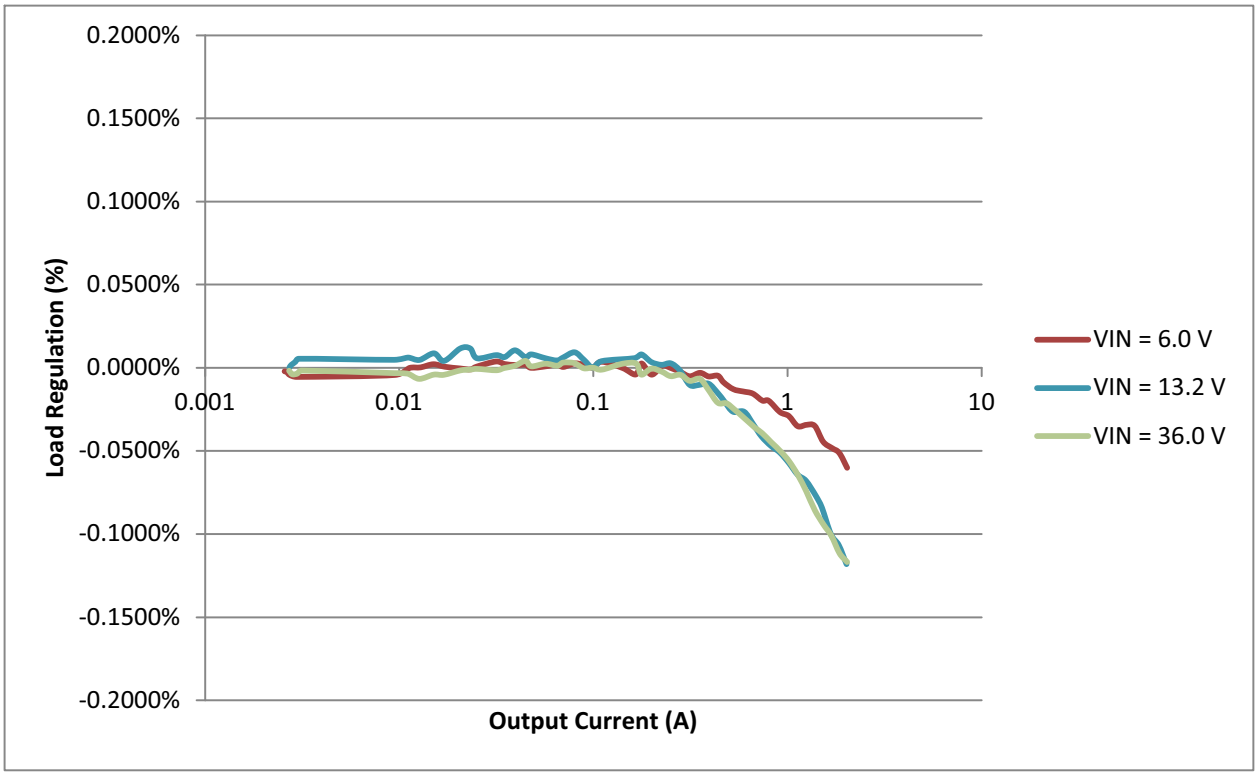

Figure 5. Load Regulation for 340 kHz and a 5.0 V Output

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SCHEMATIC

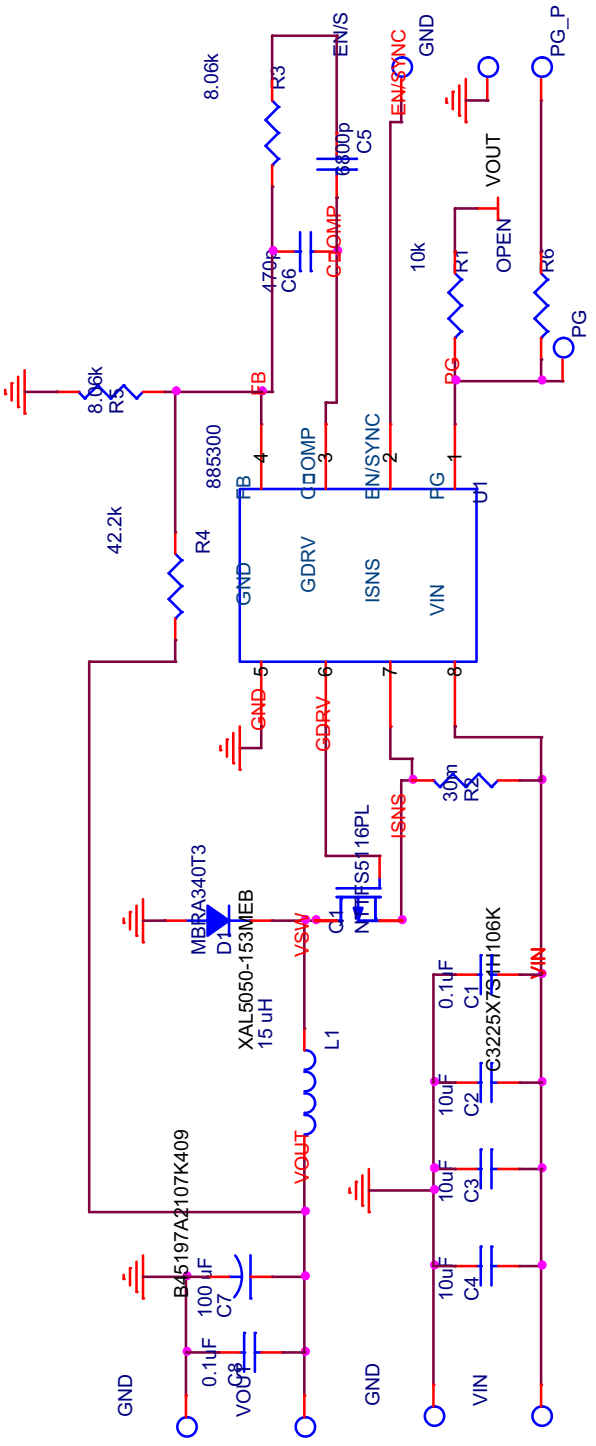

Figure 6. Evaluation Board Schematic

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PCB LAYOUT

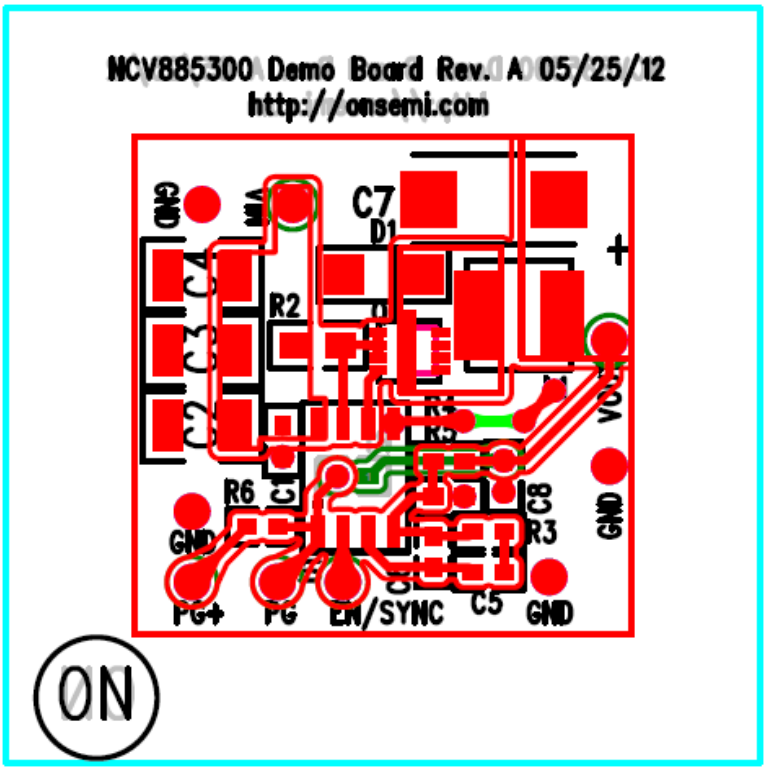

Figure 7. Top View

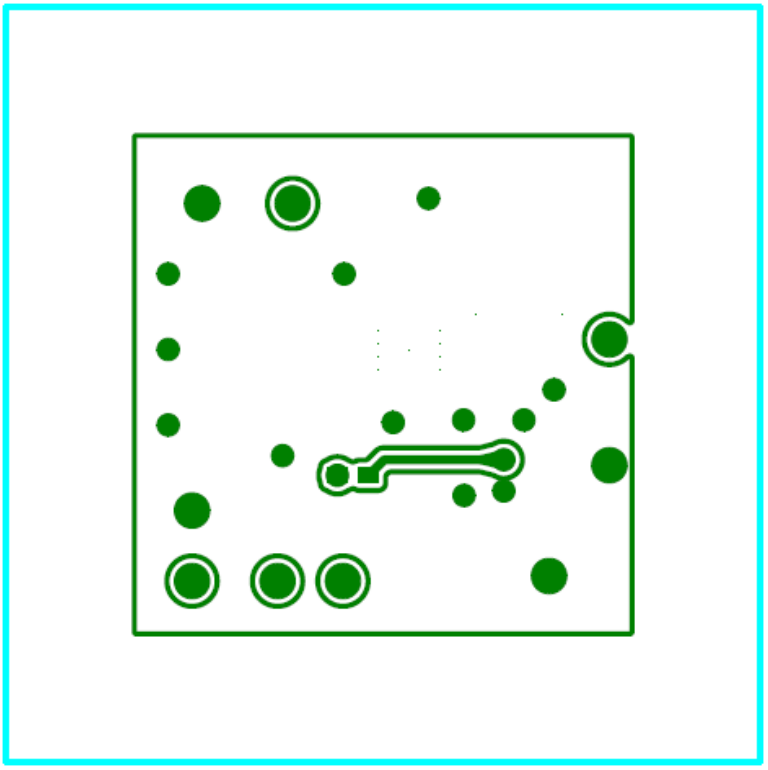

Figure 8. Bottom View

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Table 4. BILL OF MATERIALS

Reference	Value	Part #	Manufacturer	Description	Package
U1		NCV885300	ON Semiconductor	Integrated circuit	SOIC-8
Q1		NTTFS5116PL	ON Semiconductor	Power MOSFET, P-Channel	WDFN8
D1		MBRA340T3G	ON Semiconductor	Diode, Schottky, 40 V, 3 A	SMA
L1	15 μH	XAL5050-153MEB	Coilcraft	Shielded Power Inductor	5 mm x 5 mm
R1	10.0 kΩ	CRCW060310K0FKEA	Vishay/Dale	Resistor, 1%	0603
R2	0.03 Ω	WSL0805R0300FEA18	Vishay/Dale	Resistor, 1%	0805
R3, R5	8.06 kΩ	CRCW06038K06FKEA	Vishay/Dale	Resistor, 1%	0603
R4	42.2 kΩ	CRCW060342K2FKEA	Vishay/Dale	Resistor, 1%	0603
C1	0.1 μF	GCM188R71H104KA57D	Murata	Capacitor, 50 V, X7R	0603
C2, C3, C4	10 μF	GRM32DF51H106ZA01L	Murata	Capacitor, 50 V, Y5V	1210
C5	6800 pF	EMK107SD682JA-T	Taiyo Yuden	Capacitor, 16 V	0603
C6	470 pF	06033A471JAT2A	AVX	Capacitor, 25 V, NP0	0603
C7	100 μF	B45197A2107K409	Kemet	Capacitor, 10 V	2917
C8	0.1	C0603C104K8RACTU	Kemet	Capacitor, 10 V, X7R	0603

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